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# Meadows, Seeps, Cienagas and Coastal Plains

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How to Improve and  
Increase Forage Yields  
by Renovation and  
Reseeding

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*Compiled by*

**C. M. VOLKMAN & COMPANY**

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## IMPROVEMENTS OF COASTAL PLAINS, MEADOWS, SEEPS, CIENAGAS

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Many stock ranches and ranges of California, from the tidal flats to the highest elevations, contain favorable or excessive moisture areas known by one of the names given above.

These areas are potentially high in production of hay and pasture, but have often become so overgrown with sedges, rushes and other water-loving or weedy types of vegetation that their productive capacity is greatly reduced. Renovation and reseeding should result in a marked improvement in the quantity and quality of the forage.

For the best and most permanent results it is necessary to break out and thoroughly subdue the sod. Areas that are too wet for plowing at any time of the year cannot be successfully reclaimed except by installing a drainage system to intercept and draw off the excess water. A drainage engineer should be consulted as to the most effective layout to accomplish this. If drainage is not possible the best method is probably to gradually establish Reed Canary grass, or other water tolerant plants, by seeding or by the use of clones (root and crown pieces).

When the renovation of a wet and sod-bound soil is to be attempted the possibility of erosion should be considered. Many of these seepage areas are subject to flooding from melting snow or heavy rainfall. If it is known that this is likely to be severe enough to gully the area under consideration then the safest procedure is to break out strips across the erosion contour so that only a small section is exposed in any one year.

Renovation procedure depends on the character of the sod to be worked. Sometimes a thorough disking will suffice. If it is a dense sod, such as wiregrass, it is best to turn it thoroughly with a sod plow cutting at a depth of two to three inches. After plowing, the area should be disked into a rough seedbed and sown to oats with or without a legume, such as vetch. By the time this crop is taken off for hay the sod will be rotted out so that a good seedbed can be prepared for sowing the small-seeded plants used for hay and pasture. Usually the oat crop will leave a surface that is firm enough for sowing by drilling or broadcasting after a thorough but shallow disking. The seed can be pushed into the soil with a cultipacker and this will leave a high percent of it suitably placed for good germination and growth.

Seeding on the uncultivated sod of a meadow or seep has generally resulted in failure. However, a gradual "take" of some species may be attained with less effort but more patience. If the sod can be even slightly cut with



a disk, sparse stands of birdsfoot trefoil or clover, and of ryegrasses and fescue may be gradually established.

Under the conditions that generally prevail the success of the seeding can be enhanced by mowing the resident growth that will compete. It may be necessary to do this several times the first year to allow sunlight to penetrate to the seeded plants until they are fully established.

MIXTURES

The following recommendations will indicate the plants best adapted to the situations noted:

COASTAL PLAINS AND RECLAIMED TIDE FLATS

(Pounds per acre)

Birdsfoot Trefoil (Narrowleaf).....	3
Strawberry Clover (Common).....	1
Strawberry Clover (Palestine type).....	1
Common Ryegrass (Annual Ryegrass).....	2
Perennial Ryegrass .....	2
Orchard Grass .....	2
Tall Oatgrass.....	2
Alta Fescue .....	4
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If drainage is good and soil not too saline Ladino Clover can be added at 2 lbs. per acre in place of one pound each of trefoil and Strawberry Clover. On heavy soils, not too saline, 2 lbs. of Harding Grass can replace the Orchard Grass. On the central and north coast where moisture is good Big Trefoil may replace Birdsfoot Trefoil, or be sown with it. Seed of Big Trefoil should always be inoculated.

In planting peat land it is essential to have a firm seed-bed to start the small hard seeds of legumes. A cultipacker or other heavy machinery should be used for that purpose.

MEADOWS AND CIENAGAS AT LOW TO MEDIUM ELEVATIONS:

Birdsfoot Trefoil (Broadleaf).....	3
Birdsfoot Trefoil (Narrowleaf).....	1
Strawberry Clover (Palestine type).....	1
Common Ryegrass .....	2
Perennial Ryegrass.....	2
Orchard Grass .....	3
Alta Fescue .....	4
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If the soil is alkaline narrowleaf trefoil should be used in place of broadleaf. Where surface drainage is provided 2 lbs. of Ladino Clover can be added to replace 1 pound each of Trefoil and Strawberry Clover. On heavy soils Harding Grass can replace Orchard Grass.

## MOUNTAIN MEADOWS:

Alsike Clover.....	3
Birdsfoot Trefoil (Broadleaf) .....	1
Strawberry Clover (Palestine type) .....	1
Meadow Foxtail.....	2
Smooth Brome.....	3
Tall Oatgrass.....	2
Alta Fescue.....	4

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The above mixture should produce a large yield of pasture or a good tonnage of hay with an aftermath of pasture. If a greater variety is desired 2 lbs. of Redtop Grass can be added. It will add something to the late pasturage. The trefoils, especially the Broadleaf, are showing promise in high elevation meadows.

*Irrigated Meadows* frequently become weedy and sod-bound by reason of excessive irrigation and any program of meadow improvement should contemplate a readjustment in irrigation practice so that moisture will be adequate for maximum growth, but not excessive.

Protracted watering from one outlet is especially detrimental to the growth and yield of good hay and pasture plants.

Irrigation should be by rotation and with the runs short enough so that each area can be watered in a period of 24 to 48 hours.

Efficient practices in renovation, reseeding, irrigation and both haying and grazing management will generally result in a large increase in hay and pasture yields and in a marked improvement in the quality of the output.





GRASSES AND HERBS

COMMON NAME	BOTANICAL NAME	ADAPTATION	SEEDING RATE—POUNDS PER ACRE		GENERAL INFORMATION
			ALONE	IN MIXTURES	
Bromegrass Smooth (Russian)	Bromus inermis	Deep clay or clay loams medium to high elevations. Will survive late summer drought.	8 to 12	2 to 4	Erect, tall, leafy, creeping. Long growing season. Tends to become sod-bound and requires occasional renovation.
Dallis Grass	Paspalum dilatatum	All soils, hot to cool climate. Does not survive severe winters.	4 to 10	2 to 4	Tall, angled growth habit, bunchgrass, winter dormant. Strong growth in hot weather. Quick recovery after grazing. Will survive late summer drought. Withstands submergence.
Fescue Meadow	Festuca elatior	Wide range of soil and climate, but now used chiefly in mountain meadows for hay and pasture.	6 to 10	2 to 5	Erect tall bunchgrass. Less leafy than tall fescue, which has largely replaced it.
Fescue Alta (Tall)	Festuca arundinacea	Wide soil and climatic range. Good alkali tolerance.	6 to 10	2 to 5	Tall erect bunchgrass, abundant basal leafage. Long growing season and high forage yield. Will survive late summer drought. Good companion grass with Birdsfoot Trefoil.
Harding Grass	Phalaris tuberosa Var. stenoptera	Best growth on heavy loams or soils with heavy subsoil. Does not withstand severe winters. Will withstand some submergence.	2 to 6	1 to 4	Tall, erect, leafy bunchgrass with short rhizomes. Tends to winter growth. Well relished by stock.
Meadow Foxtail	Alopecurus pratensis	Wide soil range at medium to high elevations. Best adapted to wet and seepage sites.	4 to 10	2 to 4	Tall, erect, leafy bunchgrass. Increasing in popularity in Oregon. Noted for early spring growth. Endures shade.
Orchard Grass	Dactylis glomerata	All soils but adobe, moderate alkali tolerance. Wide soil and climatic range.	6 to 12	2 to 4	Tall, erect, bunchgrass, leafy at base and on stems. Long growing season. Tufty when allowed to mature. Will grow in part shade. Will survive late summer drought.
Red Top Grass	Agrostis alba	Clay or loam soils, especially those with acid reaction. Best at high elevations or on wet sites.	2 to 10	1 to 4	Erect, medium tall, creeping sod former. Late maturing. Good soil binder.
Reed Canary Grass	Phalaris arundinacea	Wide range of soil texture, medium to high elevations. Does not thrive in alkali.	4 to 10	.....	Very tall, erect, slightly creeping. Leafy and coarse. Starts growth early. Too tall and aggressive for association with other species. Will start in water and withstands prolonged submergence.
Ryegrass Common (Annual)	Lolium multiflorum	Wide soil and climatic range. Winter growing in Central and South State.	5 to 10	1 to 4	Medium tall, perennial with good moisture. Stems leafy. Starts rapidly and gives early ground cover. Withstands moderate submergence.
Ryegrass Perennial	Lolium perenne	Wide soil and climatic range.	5 to 10	1 to 4	Less tall than annual. Small bunchgrass with abundant basal leafage. Will survive late summer drought. Withstands moderate submergence.
Tall Oatgrass (Tall Meadow Oatgrass)	Arrhenatherum elatius	Acid, neutral or slightly alkaline soils. Central and North Coast and medium to high elevations.	10 to 15	3 to 8	Tall, erect bunchgrass, with leafy stems. Good in a mixture for hay and pasture.
Tall Oatgrass Tualatin	Arrhenatherum elatius	Acid, neutral and slightly alkaline soils. Central and North Coast and high elevations. May have a wider range than the common strain.	10 to 15	3 to 8	A selection of Tall Oatgrass, with more basal leafage.
Timothy	Phleum pratense	Wet soils at high elevations.	6 to 10	2 to 6	Tall, erect, leafy bunchgrass growing from a swollen or bulb-like base. Short-lived, late maturing. Little grown in California, but useful in mountain meadows.
Velvet Grass	Holcus lanatus	Wide soil adaptation on North Coast and at high elevations.	8 to 10	3 to 6	Tall, hardy, long-lived bunchgrass, tufty. Pale in color. Hairy. Produces a light hay. Low in palatability, but grazed by cattle and sheep where it occurs naturally. Should be used only where other grasses do not thrive.

LEGUMES

Alsike Clover	Trifolium hybridum	Acid or neutral soils. Best growth at high elevations, but will do well at low elevations where soil moisture is plentiful.	5 to 20	1 to 5	Semi-erect, leafy, sparsely pubescent. A popular hay and pasture legume at high elevations and where drainage is poor.
Big Trefoil	Lotus uliginosus (L. major)	Seepage and marshy land. Best adaptation on North Coast and semicoastal areas.	1 to 4	½ to 3	Larger and more erect than Birdsfoot. Has creeping rhizomes, withstands much submergence. Requires inoculation to start.
Birdsfoot Trefoil Broadleaf (erect)	Lotus corniculatus var. vulgaris	Wide range of soil and climate. Best growth in neutral or acid soils. Will survive late summer drought.	3 to 5	1 to 3	Stronger stemmed than tenuifolius, semi-erect. Leaflets over half as wide as long. Recovers rapidly after grazing.
Birdsfoot Trefoil Narrow leaf (prostrate)	Lotus corniculatus var. tenuifolius	Wide range of soil and climate. Alkali tolerant. Will survive late summer drought.	3 to 5	1 to 3	Prostrate except where held up by close association, leafy with long runners. Deep-rooted, but adaptable to wet or shallow soils. Relished by all stock. Withstands submergence.
Ladino Clover	Trifolium repens var. latum	Wide range of soil and climate except extreme cold winters. Useful if drainage is provided. Does not withstand excessive soil moisture.	4 to 8	1 to 5	Semi-erect with runners, no central stems. Very leafy, shallow-rooted. Rapid recovery after grazing. Not popular as a hay plant.
Red Clover	Trifolium pratense	Well drained soils of mountain meadows and high elevation pastures.	4 to 8	1 to 3	Semi-erect, short-lived perennial. Leafy, strong, sturdy growth. A fine clover for hay, with aftermath of pasture where not subject to mildew.
Strawberry Clover (common)	Trifolium fragiferum	Wide soil range, alkali to acid. Endures severe winters and all but extreme summer heat. Will survive prolonged submergence.	4 to 8	1 to 3	An understory legume with long runners rooting at the nodes. Leafage short but abundant. Shallow-rooted. Late fall growth. A good soil binder due to creeping habit.
Strawberry Clover (Palestine type)	Trifolium fragiferum	Wide range of soil texture. Endures severe winters and all but extreme heat. Will survive long submergence.	4 to 8	1 to 3	Same growth habit as Common, but taller and with larger leaves. Useful for late fall pasturage. In the northwest, Palestine Strawberry Clover is recognized as having the same range as the Common. Until further experience is gained here we recommend a blend of both.
Subclover (subterranean clover)	Trifolium subterraneum	Wide range of soil texture. Prefers acid soil, tolerant of moderate alkalinity, same climatic range as Bur Clover, where temperatures permit winter growth.	3 to 6	1 to 3	Annual, semi-prostrate with runners. Pegs part of its seed into the soil. Useful on sites where summer moisture is insufficient to support a good stand and growth of perennial legumes.
White Clover (White Dutch Clover)	Trifolium repens	Wide soil and climatic range. Best growth at high elevations. More winter hardy than Ladino.	4 to 8	1 to 5	Growth habit like Ladino but much smaller. Withstands wet land if not too long submerged.
White Sweet Clover	Melilotus alba	Wide soil and climatic range. Very alkali tolerant. Not adapted to strongly acid soils. Good where top soil is dry in late summer.	4 to 10	1 to 5	Biennial, tall, branching, leafy. Tap-rooted. Will do best where drainage has been provided.
Yellow Sweet Clover (common)	Melilotus officinalis	Wide soil and climatic range. Very alkali tolerant. Not adapted to strongly acid soil. Will survive late summer drought.	4 to 10	1 to 5	Biennial, branching tap-rooted. More leafy and less tall and coarse than White.
Yellow Sweet Clover (Madrid)	Melilotus officinalis	Wide soil and climatic range. Very alkali tolerant. Not adapted to strongly acid soil. Will survive late summer drought.	4 to 10	1 to 5	Biennial. A selection of Yellow Sweet Clover that is more robust, leafier and more drought resistant.



## REFERENCES

For specific recommendations on improving areas described in this booklet write or contact the pasture department, C. M. Volkman & Company, 55 Union Street, San Francisco.

Local county farm advisors are also excellent sources of information since they are constantly in touch with local conditions.

Further information will be found in the College of Agriculture Extension Circular Number 129, entitled "Improving California Ranges" (page 7).

## PALATABILITY

Many attempts have been made to set up definitions of the comparative palatibility of pasture plants. Palatibility is an illusive term that has no fixed status and upon which authors and investigators are not in agreement. It varies with climatic and soil conditions and other environmental factors. The sweet clovers, lupins and some others that contain coumarin or other bitter elements, at all times or at certain stages of growth, are not relished by livestock at the first contact, but sweet clovers are usually consumed after a taste for them has been developed. Palatibility also varies with the stage of growth and is directly related to nutritive values and fiber content. It is, then, closely related to pasture management. All plants recommended for pasture planting can be considered as high in this respect. Beyond a few extremes noted for some species, degrees of palatibility are not definable in any terms that are likely to be of value to graziers.



## NUTRITIVE VALUES

The differences in actual feed values among the various grasses and the legumes used in pasture mixtures are not great enough to be significant.

Legumes are lower than grasses in percentage of dry matter and higher in protein. Grasses are higher in total digestible nutrients and in crude fiber.

When grazing management is so regulated that the plants are consumed at some stage between full leaf maturity and the beginning of seed formation the highest nutritive values will be secured.

Mixtures of grasses and legumes have long since been demonstrated as desirable for variety in the diet and for the best nutrition of cattle and sheep.